Public Abstract

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Graduation Term:FS 2016
Department:Civil Engineering
Degree:MA

Title:Ferroxane Derived Ceramic Composite Material as Catalysts for Heterogenous Fenton Reaction for Dyes and Pharmaceuticals Removal in Water

Pharmaceuticals are synthetic or natural chemicals that can be found in prescription medicines or over-the-counter drugs, and drugs used for animals. Pharmaceuticals can enter water sources through sewage, which transports the waste of individuals and patients who have used these chemicals, from uncontrolled drug disposal, such discarding drugs into toilets, and from agricultural runoff. Trace amounts of pharmaceuticals, reportedly measured in parts per billion or trillion, including antibiotics, hormones, and mood stabilizers are in our drinking water supplies. Although levels are low, pharmaceuticals are chemicals of emerging concern to the public because of their potential health effects on humans and animals even at those low doses.

Antibiotics are commonly used for livestock to promote their growth and to prevent and treat diseases. Residues of antibiotics were found in livestock's manure, which is intended to be used as fertilizer on farm fields. Farm products such as corn, potatoes and lettuce can absorb antibiotics when manure is applied. Furthermore, the antibiotics may accumulate, which increases their concentration levels in soil and farm products. This will result in undesirable health effects on humans, animals and ecosystems, since the overuse of antibiotics reduces the ability to cure infections and over time certain antibiotics are rendered ineffective as microorganisms develop resistance through natural selection.

Antibiotics are not treatable by biological processes, and therefore, it's necessary to find another cost effective method to treat those non-biodegradable compounds. The use of advanced oxidation processes (AOPs), such as Fenton processes, for the treatment of non-biodegradable compounds can be an effective way to remove pharmaceuticals from water streams.

In this project, a novel iron oxide (ferroxane) based nanostructured ceramic membranes will be synthesized as catalyst for heterogeneous Fenton, which can be used for the degradation of pharmaceuticals in water. Iron oxides are interesting materials for ceramic membranes due to their efficient catalytic properties, adsorption properties, low cost and limited toxicity. However, there are no commercially available iron oxide membranes to date.

The goal of this project is to fabricate iron oxide (ferroxane) ceramic membranes as catalysts for heterogeneous Fenton reactions, which will ultimately be used in the degradation of non-biodegradable organic compounds, such as pharmaceuticals, in water. This project was developed due the increasing concern about the effect of pharmaceuticals in water, and the need for effective, economical method for treatment.